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# मानक

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IS 9175-19 (1986): Rationalized Steels for the Automobile and Ancillary Industry, Part 19: Mechanical and Physical Properties of 16Mn5Cr4 Grade Steel [MTD 16: Alloy Steels and Forgings]



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“Knowledge is such a treasure which cannot be stolen”



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IS : 9175 ( Part 19 ) - 1986

*Indian Standard*

RATIONALIZED STEELS FOR  
THE AUTOMOBILE AND ANCILLARY INDUSTRY

PART 19 MECHANICAL AND PHYSICAL PROPERTIES OF  
16Mn5Cr4 GRADE STEEL

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**INDIAN STANDARDS INSTITUTION**

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# Indian Standard

## RATIONALIZED STEELS FOR THE AUTOMOBILE AND ANCILLARY INDUSTRY

### PART 19 MECHANICAL AND PHYSICAL PROPERTIES OF 16Mn5Cr4 GRADE STEEL

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*Indian Standard***RATIONALIZED STEELS FOR  
THE AUTOMOBILE AND ANCILLARY INDUSTRY****PART 19 MECHANICAL AND PHYSICAL PROPERTIES OF  
16Mn5Cr4 GRADE STEEL****0. FOREWORD**

**0.1** This Indian Standard ( Part 19 ) was adopted by the Indian Standards Institution on 27 March 1986, after the draft finalized by the Co-ordinating Committee on Materials for Automobiles had been approved by the Structural and Metals Division Council.

**0.2** Part 1 of IS : 9175\* was published in 1979 which covers the chemical composition of 33 rationalized steels. The mechanical properties, hardenability and isothermal transformation characteristics of these 33 rationalized steels are being covered in different parts of this standard ( Parts 2 to 34 ). The data concerning to these properties given in this standard is only for guidance and information purposes.

**0.3** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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**1. SCOPE**

**1.1** This standard ( Part 19 ) covers the chemical composition, mechanical properties and hardenability characteristics of 16Mn5Cr4 grade of steel for use by automobile and ancillary industry.

\*Rationalized steels for the automobile and ancillary industry: Part 1 Chemical composition.

†Rules for rounding off numerical values ( revised ).

## 2. CHEMICAL COMPOSITION

2.1 The chemical composition of this grade of steel shall be as given below:

<i>Constituents, Percent</i>					
C	Si	Mn	Cr	S	P
0.14-0.19	0.15-0.35	1.00-1.30	0.80-1.10	0.035, <i>Max</i>	0.035, <i>Max</i>

## 3. HARDNESS

3.1 The maximum hardness for this grade of steel delivered in the annealed or normalized condition when determined in accordance with IS : 1500-1983\* shall be 207 HBS.

## 4. MECHANICAL PROPERTIES

4.1 The mechanical properties of this grade of steel in the blank carburized and hardened condition when determined in accordance with IS : 1598-1977† and IS : 1608-1972‡ shall be as given below:

- a) Tensile strength, MPa, *Min*, 785
- b) Elongation, percent, *Min*, 10  
( gauge length  $5.65 \sqrt{A}$  )
- c) Izod impact value, joules, *Min*, 35  
at room temperature
- d) Limiting ruling section, mm 30

## 5. HOT WORKING AND HEAT TREATMENT TEMPERATURES

5.1 The recommended hot working and heat treatment temperatures are given below:

Forging/rolling temperature	1 200°C
Carburizing temperature	850-930°C
Refining temperature	850-880°C
Hardening temperature	810-840°C
Tempering temperature	210°C, <i>Max</i>

\* Method for Brinell hardness test for metallic materials ( *second revision* ).

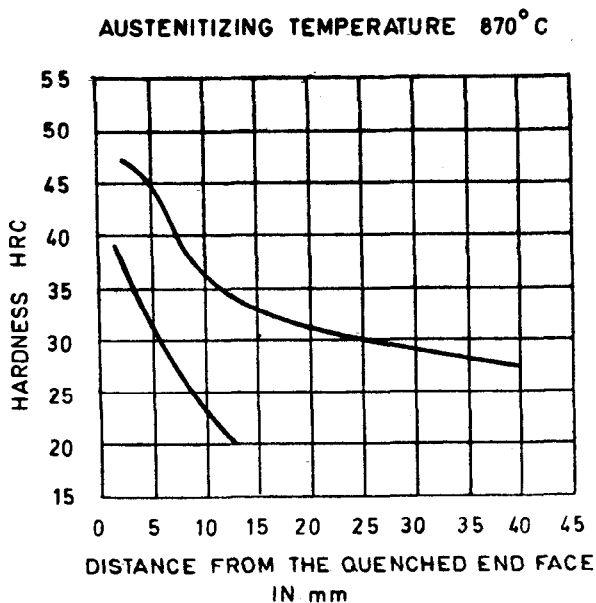
† Method for Izod impact test of metals ( *first revision* ).

‡ Method for tensile testing of steel products ( *first revision* ).



## 6. HARDENABILITY

6.1 The end quench hardenability band is given in Fig. 1.



Distance mm	1	2	3	4	5	6	7	8	9	10	15	20	25	30	35	40
<i>Min</i> ( HRC )	39	37	35	32	31	29	28	24	24	23	—	—	—	—	—	—
<i>Max</i> ( HRC )	47	47	46	45	44	44	41	38	37	36	33	31	30	29	28	27

FIG. 1 END QUENCH HARDENABILITY TEST DATA OF  
16Mn5Cr4 GRADE STEEL

## 7. EFFECT OF SECTION SIZE ON MECHANICAL PROPERTIES

7.1 The curves for the effect of section size on mechanical properties ( of core ) are given in Fig. 2 and 3.

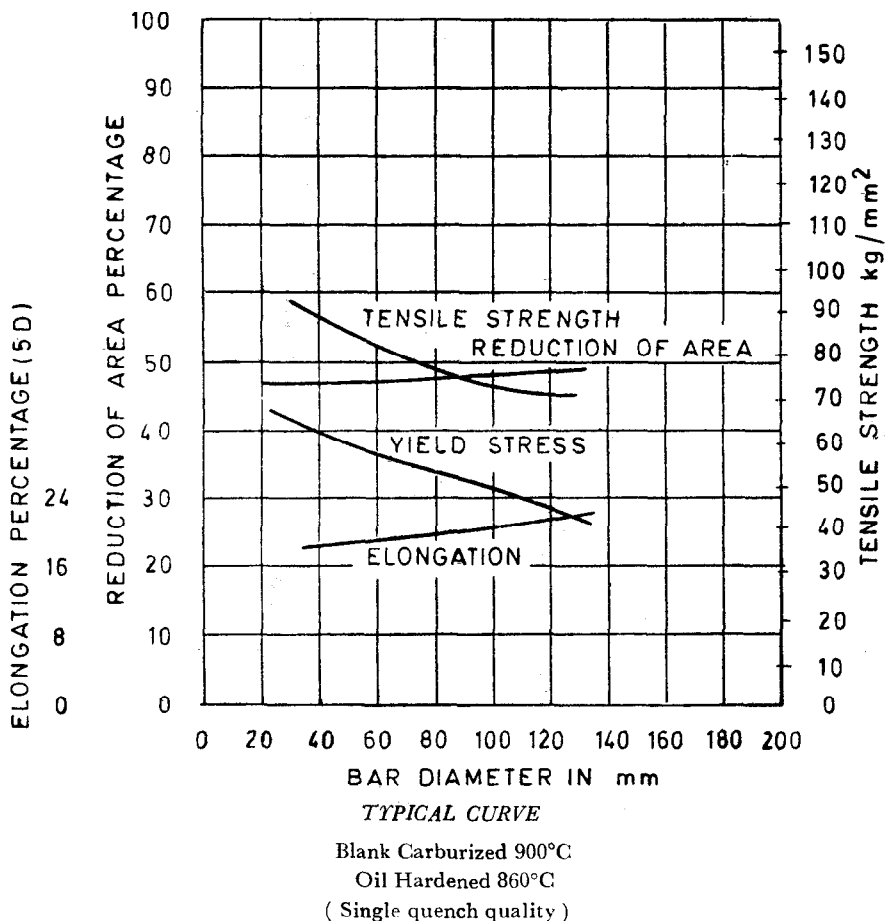
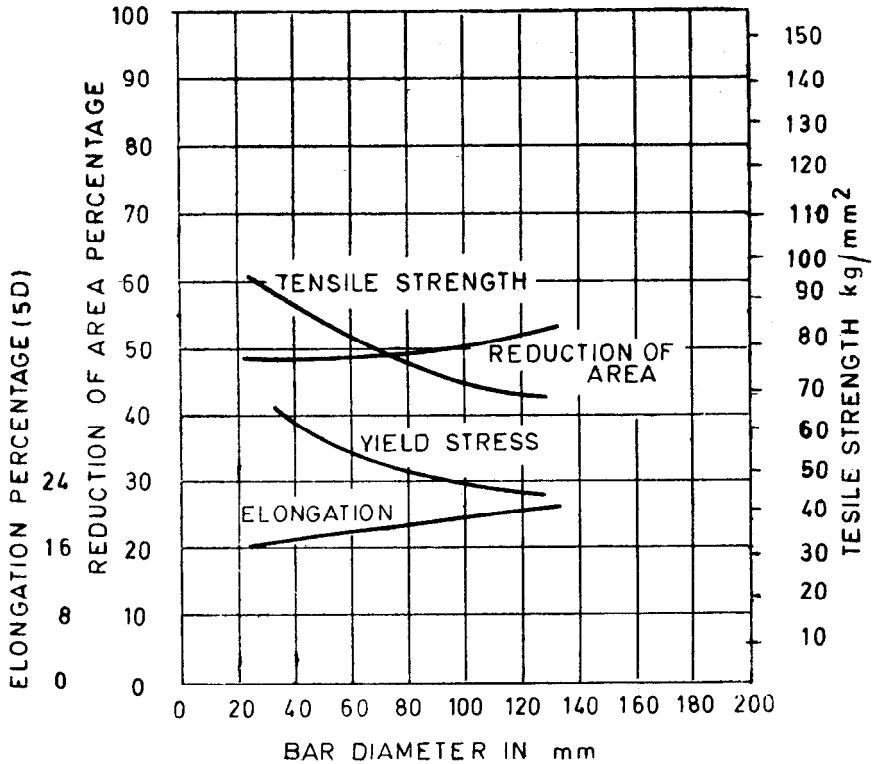


FIG. 2 EFFECT OF SECTION SIZE ON MECHANICAL PROPERTIES  
 ( OF CORE ) OF 16Mn5Cr4 GRADE STEEL



*TYPICAL CURVE*

Blank Carburized 900°C

Oil Refined 860°C

Oil Hardened 800°C

FIG. 3 EFFECT OF SECTION ON MECHANICAL PROPERTIES ( OF CORE )  
OF 16Mn5Cr4 GRADE STEEL

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**Panel to Collect Data on Steel for Automobile Purposes, SMDC 31/P12**

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